tor and converting the changes in this current caused by variations in the resistance value (caused by temperature variations) into voltage values.

The microcomputer **10** derives a value T_d from the value of temperature difference ΔT and the ambient temperature T_a, in the following way (step **112**):

$$t_d T_a - \Delta T$$

where T_d is the dew point temperature of the cooling section of Peltier cooling means **2**.

FIG. **9** is a graphical approximation of the wellknown relationship between ambient temperature and water vapor saturation pressure. Values representing this graphical approximation are stored as a table in a ROM of microcomputer **10**. In this way, when the values of ambient temperature T_a and dew point temperature T_d are input to it , microcomputer **10** can derive the corresponding values of water vapor saturation pressures P_a and P_d respectively.

The absolute humidity is defined as the water vapor saturation pressure P_d, and the relative humidity is defined as the ratio P_d/P_a. Thus, both of these humidity values can be obtained by computation utilizing the values of P_d and P_a (step **112**).

If required by the user, it can be arranged that microcomputer **10** will output the dew point temperature T_d, the absolute humidity P_d and the relative humidity P_d/P_a, through interface **11**) to external equipment (step **114**).

In the steps of the flow chart described above, the cooling current is successively reduced in steps of N % from the maximum value thereof until condensation of water droplets has ceased. The cooling current is thereafter successively increased in steps of M % until condensation once more begins. Due to the fact that the value of N is made higher than M, the approximate value of the dew point temperature is first determined and then the precise dew point temperature is determined by smaller cooling current increments. This method enables a high response speed to be attained. However, it would be equally possible to successively decrement the cooling current in minute steps, starting from an initial maximum current value, with the temperature at which condensation of water droplets occurs being be taken as the dew point temperature. Furthermore, it is equally possible to set the initial value of the cooling current at the minimum value thereof, and to successively increment the cooling current from that initial value. It is also possible to vary the duty ratio for which cooling current is applied during each step, rather than to apply cooling current continuously during each step.

In the embodiment described above, a pair of mutually opposed electrodes are used as the water droplet sensing means. However, it is equally possible to use a moisture-sensitive element whose characteristics exhibit an abrupt change when water droplets adhere thereto. Such an element could be formed of a material such as $Zn_3(PO_4)_2$, or $Zn_3(PO_4)_2$ and $LiPO_4$.

With a humidity sensing element according to the present invention as described hereinabove, Peltier cooling means are concentrated in a central region of the humidity sensing element to form a cooling section, while water droplet sensing means is disposed so as to detect the adherence of water droplets to an upper part of the cooling section. The Peltier cooling means and water droplet sensing means are integrated upon a substrate having a central portion thereof cut out. As a result, the cooling section is thermally insulated so that local cooling can be executed by employing a minute level of current to rapidly cool only the necessary portion of the humidity sensing element. In addition, by appropriate switching of external circuits connected to the Peltier cooling means, it can be also utilized as a temperature difference sensing means. An extremely rapid speed of response with respect to measurement of atmospheric humidity can thus be obtained, by utilizing the output signals from the Peltier cooling means and the water droplet sensing means.

In addition, due to the fact that only localized cooling of the humidity sensing element is employed, only local cooling of the air will occur, so that the air which is being measured will not be thermally disturbed. For this reason humidity measurement can be performed by such an element within an extremely small space. Furthermore, due to the fact that only localized cooling of the humidity sensing element is used, no cooling of other parts of the element will ocuur so that these are maintained at ambient temperature. Thus, if desired, an ambient temperature sensing element can be integrated with the humidity sensing element.

As usual in the fabrication of integrated circuits, a large number of humidity sensing elements can be manufactured at the same time, each element having all of the functions which are necessary for humidity sensing, so that low manufacturing cost can be attained.

The embodiments of the invention in which an exclusive property or right is claimed are defined as follows:

1. Integrated circuit cooling apparatus comprising:
a substrate having peripheral and central portions;
Peltier cooling means formed upon said substrate; and
an insulating layer formed between said Peltier cooling means and said substrate, said Peltier cooling means comprising a plurality of first metallic layer patterns, each first pattern having an end portion overlaying the peripheral portion of said substrate and an end portion overlaying the central portion of said substrate, and a plurality of second metallic layer patterns disposed in an alternating manner with said first patterns, each second pattern having an end portion overlaying the peripheral portion of said substrate and an end portion overlaying the central portion of said substrate, with junctions being successively formed between end portions of said first metallic layer patterns and said second metallic layer patterns, and with successive ones of said junctions being alternately disposed over the peripheral portion of said substrate and the central portion of said substrate respectively, the central portion of said substrate being removed therefrom.

2. Humidity sensing apparatus comprising:
a substrate, having peripheral and central portions;
Peltier cooling means formed upon said substrate;
an insulating layer formed between said Peltier cooling means and said substrate, said Peltier cooling means comprising a plurality of first metallic layer patterns, each first pattern having an end portion overlaying the peripheral portion of said substrate and an end portion overlaying the central portion of said substrate, and a plurality of second metallic layer patterns disposed in an alternating manner with said first patterns, each second pattern having an end portion overlaying the peripheral portion of said substrate and an end portion overlaying the central portion of said substrate, with junctions